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ABSTRACT

This study compares modes of cognitive functioning revealed in student selection of a college major. Students were interviewed in-depth concerning reasons for their choice of majors. Protocol data suggested two distinct modes of thinking were evident on an analytic-intuitive dimension. For operational purposes analytic thinking was defined by publicly verifiable and well-defined premises leading to logical-rational conclusions. Intuitive thinking was defined by emotional involvement and global impressions which formed the basis for justification and selection of a major. Questionnaires were administered to a sample of 600 undergraduates, and an index score was computed for each student reflecting the relative importance of analytic versus intuitive statements. The intuitive dimension was found to be more important (a) to students as they progressed through school, and (b) for students in soft (Humanities) as opposed to either hard (natural sciences) or business curricula. Females with soft majors had more analytic scores than males in soft majors, and females in business majors had more intuitive scores than males in business majors. Additional analyses showed that students who had changed majors two or more times had higher intuitive scores than those who had never changed majors. (Author/LP)

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Student Career Decisions: The Limits of Rationality

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"When I came here, my main goal was to finish vet school and then work in the peace corps for a few years. Now I'm not so sure. I am coming to realize veterinary medicine is probably not what I want so I have begun to search out other areas. I continue in this curriculum because it is set and I don't have to make any decisions or choices." (Kansas State University Freshman)

"I came to K-State with the feeling I had to have a degree to be successful. I don't feel that way now. I feel it's a waste of time to stay in school." (Student body president of Kansas State University; Senior)

A Collegian[1] reporter summarizes the dilemmas of career choice illustrated above: "The great search -- freshman think about it, sophomores talk about it, juniors reflect upon it, and seniors have ended it. Or have they?" The thinking illustrated here and typical of many college students is characterized by fluctuating goals and premises relevant to career decisions. Such shifts in thinking, mediated by college experiences, represent the focus of the present study.

Specifically, the present work investigates different modes of thinking shown in students selection of a college major. This will involve relating two bodies of work: (a) research on thinking as a multi-dimensional process and (b) applied studies of career decision processes.

[1]Kansas State University student newspaper. Both quotations are from January 1973 editions of the Collegian.

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The Multi-Dimensionality of Thinking

Historically, "(T)the psychology of thinking seems to breed dichotomies." (Neisser, 1963, p. 1). The extensive philosophical-theoretical tradition of thinking about thinking in dichotomies (c.f. Westcott, 1968) reflects a widely shared belief in the importance of different levels of functioning in human experience. Even Skinner (1969) po.its a two-fold view of cognition. He sees a rule-following analytic strategy and an intuitive contingent mode.And the very process of science has been seen to rely on different modes of thought. Polanyi (1966) for example, argues that the solution of scientific problems rests on the ability to alternate between analytic and intuitive thinking.

In current research, three general approaches to the study of multiple processes or cognitive modes are evident. This work will be reviewed with two purposes in mind: first, to characterize these general approaches and their findings, and second to indicate how different cognitive modes have been assessed and defined.

The first and most prevalent approach are studies of individuals whose thinking is characterized by different cognitive modes. This work has involved studies of empathetic ability and clinical inference (c.f. Tagiuri, 1969), and the assessment of personality and behavioral characteristics associated with different cognitive styles (e.g.

Crockett, 1965; Witkin, et al. 1954; Harvey, Hunt & Schroder, 1961). Westcott (1968) for example, found intuitive thinkers to be flexible, emotionally involved and spontaneous. More certainty-geared individuals were characterized as relatively less flexible and spontaneous, more cautious and compliant.

Other studies in this vein indicate that persons utilize different thinking strategies when trying to achieve global or asethetic as opposed to analytic or scientific goals (Gittins, 1969; Lee, Kagan & Rabson, 1963). Such findings suggest that personality attributes and differences in thinking strategies form an integrated configuration, depending upon the persons' goals.

A second general approach seems characterized by concern with task-thinking relationships. This approach leads to studies of the ecological correlates of different cognitive modes. Intuitive and perceptual modes of cognition for example, appear relatively independent of external measurement aids (Bjorkman, 1971) and the symbolic properties of the task (Benjafield, 1969; Lindahl, 1968). But as these task components become salient more analytic strategies are evident. Ongoing cognitive processes may also be experimentally disrupted to produce shifts to other modes. Gilbert and Rappoport (1972) for example, have induced shifts from purely analytic strategies to more image-laden intuitive thinking. This work

demonstrates how task demands and structure tend to elicit alternative cognitive modes. Of equal importance are studies showing how one of several alternative thinking strategies may be viable under varying ecological demands (e.g. Kuhlman, 1960). For example, the task can be approached by various means involving different modes of cognition, such as imagery versus symbolic manipulation.

Taken together both lines of work discussed above indicate that levels of functioning are determined by the interaction of ecological structure and demands on the one hand, and individual characteristics and goals on the other. Differential cognitive functioning can be assessed by noting differences in the goals being maximized (e.g. aesthetic versus scientific) and the task structure. Task dimensions may either be specified and limited by situational arrangements, or in less restrictive environments, selected by the individual.

A third line of research is derived from cognitive-developmental theory (e.g. Piaget & Inhelder, 1969; Werner, 1943). Besides the well-known work of Piaget (c.f. Flavell, 1963) this research also includes extensions of developmental theory to adult moral judgments (c.f. Kohlberg, 1969) and various other stage-sequence relations. Important here is the notion that in addition to age-related changes, developmental shifts in thinking also result from extended experi-

ences in specific situations. Perry (1970) for example, has reported that cognitive-developmental changes among students, depends upon the quality of their experiences in college.

Briefly summarized, past research and theory indicates that differing modes of cognition may reflect stable individual differences, specific ecological demands and developmental sequences. Thinking modes have been assessed by specifying differences in (a) the nature of the information provided or selected (e.g. symbolic versus perceptual), (b) the characteristics of cognitive organization (e.g. rule-following versus configural) and (c) the goals being maximized (e.g. logical rational versus asethetic achievement).

Theoretical Definitions

Also evident in past research and theory are a variety of definitions used to characterize the distinction between different thinking modes. While several distillations of the commonalities among them are possible, a general definition can be offered which shares much with prior conceptualizations (e.g. Neisser, 1963; Bruner, 1961; Hammond, 1964) and is represented in many aspects of current research. The definition used in the present work involves a continuum of thinking processes ranging from analytic to intuitive. Specifically this continuum emphasizes the distinction between logical-

rational conclusions based on rather explicit rule-following processes in combining relatively objective (and often quantified) premises on the one hand, and more implicit organization of perceptual, global and often affect-laden information and experiences on the other.

As an example of the analytic-intuitive extremes as well as the middle ground between them, consider the several approaches one could follow in purchasing a new car. An individual could gather all the relevant statistics and expert opinion and then evaluate this information according to some formula; for example to make the most precise match between size of one's pocketbook and cost, efficiency and maintenance. Opposed to this, more global impressions toward feelings of handling ability, power and looks could also provide a basis for the decision, independent of statistical comparisons. As we know from experience however, the usual state of affairs is some middle ground (denoted here as quasi-rational thinking) in which both processes operate simultaneously. We have both facts and feelings.

The relation of this thinking continuum to the practical problem of vocational choice lies in the extent to which different cognitive modes can represent student's thinking toward career decisions. Several lines of work investigating career-decision processes indicate that an analysis of different thinking strategies would be fruitful.

Approaches to Vocational Choice

The primary relationship between theories of thinking and vocational choice lies in the assumption of rationality in career selection. This has involved an ideal model of matching objectively determined abilities and interests, largely as assessed by standardized tests, with appropriate vocational paths. The biggest problem with this model is that it is seldom followed.

> "I doubt if very many people actually choose jobs this way, and if they did, I do not think they would be very successful, even though superficially this approach looks simple and easy and perhaps even scientific" (Hackman, 1968, p. 377).

Largely due to the inadequacy of a purely rational model, current vocational research and theory has tended to emphasize personality dynamics and social influences on the one hand, and cognitive processes and cognitive-developmental changes on the other. The former approach has sought the antecedents of career choice in (a) personality and self-concept development and (b) the matching of personality and social traits with the characteristics of the chosen field. (C.F. Osipow, 1968). For example, three stages of development toward career selection (fantasy, tentative and realistic) have been adduced (Ginzberg, Ginginsberg, Axelrad and Herma, 1952), and a positive relationship has been reported between degree of impulsiveness and satisfaction with a social science major

(Kipnis, Lane & Berger, 1967). Work emphasizing social characteristics has investigated the influence of socio-economic status, peer-group pressures and value orientations on career decisions. Social science majors, for example are generally more politically liberal and people-oriented as opposed to more conservative and thing-oriented natural science majors (Bereiter & Freedman, 1962). A consistent finding is the confusion and frustrations over career decisions characteristic of "sophomore slump" (Taylor, 1962). This is in marked contrast to freshman who seem to have both stable images of career options (Beardslee & O'Dowd, 1962) and an untroubled attitude toward career decisions (Sanford, 1962, b). Madison (1968) has suggested that the change is due to strong external influences (e.g. parents and counselors) on early career choice. Based on these pressures, students enter college with an "initial organization" which is eroded through college experiences as students come to give greater weight to their own feelings and values. Thus, "sophomore slump" is seen as a sorting out of personal and external factors.

As Rappoport (1972) notes, a major limitation of the social/personality approach is that it offers little insight as to how or on what premises the actual career decision is made. More cognitive approaches, while not directly representing the decision do show differences in thinking orienta-

tions among students in various curricular groups and levels of education.

Cognitive Approaches

Few studies have attempted to assess developmental changes in how students thinking about careers. Many studies have simply assessed differences in specific mental abilities between freshman and senior samples, generally showing higher scores for the latter group (e.g. Webster, Freeman & Heist, 1962). Investigations of more global attributes indicate that the thinking of graduate students is more tolerant and flexible than freshmen thinking, but show little evidence that experiences in liberal arts curriculum produces critical thinking (Dressel, 1958). In a comprehensive developmental study Perry (1970) has shown the growth of a relativistic perspective in student thinking. Students become increasingly aware of the relativity and arbitrariness regarding the correctness of life decisions, and as a result develop their own unique commitments. That is, students come to realize that there are no objectively correct career choices. It is a personal decision, with the individual student, rather than test scores, counselors advice, etc., being the final arbitrator of what is a correct career choice. This suggests, as did previous work, that personal goals, feelings and commitments become increasingly integrated into student thinking as he progresses through college.

Other work indicates that students in various curricular groups can be distinguished by different mental abilities and thinking orientations. A reliable rank ordering of mental and deductive logic abilities associated with various major areas has been established, with students in natural sciences at the top and those in humanities and social sciences at the bottom (Learned & Wood, 1938; John, 1957). Several researchers have employed tests of field dependence-independence (Witkin, et al 1954) and cognitive complexity (Bieri, 1955) to distinguish the cognitive style of students in different major areas. Osipow (1969) found field dependent students to choose areas requiring personal involvement and which were oriented toward people (e.g. education) while field independent students were more likely to choose natural science majors. Booden and Klein (1972) report that cognitive complex students make more "appropriate"[1] vocational choices than less complex subjects. They suggest that the greater number of constructs characterizing complex subjects enables these students to make finer occupational discriminations and thus attain a "better" match between their own characteristics and a field of study.

Little is actually known about the thinking modes evident in students choice of college majors. While studies have shown that differences in cognitive styles are associ-

[1]defined by the degree of match between Holland's Vocational Preference Inventory and the student's actual choice.

ated with various major areas, the assessment of these styles has been largely independent of the factors on which students may base their decisions. That is, the fact that natural science majors tend to be field independent does not tell us whether this cognitive style characterizes the decision process leading to choice of majors. The limitations of studies which simply match various traits, styles and behaviors to students chosen major have also been noted by Bereiter and Freedman (1962). They note that studies have shown scientists to employ very different strategies in their approaches to research problems (e.g. Gough & Woodworth, 1960). For example, "likes to play his hunches" versus "seeks out the help of others." However, the relationship of thinking strategies found in other domains to career decisions is relatively unexplored.

In addition to the relative lack of studies investigating the role of modes of thought in career decisions, little attention has been given to the interplay of cognitive and affective variables. That cognitive and affective variables may have co-determinant effects on career choices is shown in a recent study by Bodden and Klein (1973). Students were found to be more cognitive complex in their thinking toward disliked than toward liked occupations. This finding was interpreted as reflecting the need to make

finer discriminations in relation to disliked occupations to avoid the negative consequences of a wrong choice. Thus, it was suggested that negative feelings tend to lead to more complex thinking. While these findings indicate that feelings influence thinking, it is unclear what role affective responses have in students actual choice of occupations.

It would seem reasonable that both a cognitive-affective dimension and different modes of thinking would be important to career decisions. Recall the example given in the discussion of theoretical definitions. Just as individuals may decide to purchase a particular car on the basis of global feelings or statistical information, one may also adopt an intuitive or analytic orientation toward choice of a college major. An individual can, for example, use feelings and emotional satisfaction as a basis, or rely on more analytic factors, such as grades and vocational-aptitude test scores.

The present study is an investigation of different thinking modes in relation to student's choice of a college major. Specifically, the thinking of students in various fields of study and stages of education will be assessed in terms of an analytic-intuitive dimension. The relative dominance of one or the other thinking orientation will be assessed in terms of the nature of the premises on which

the career decision is based. Extrapolating from past research it is expected that freshman and students in natural science curriculum will show more analytic thinking than sophomores or students in humanities, who will be characterized by more intuitive thinking. Thus, general developmental changes as well as specific individual differences will be examined.

Design and Procedures

Scale Development

Students were interviewed in depth concerning reasons for their choice of college majors. Protocol data suggested the reasons given could be coded on an analytic-intuitive dimension. For the purpose of this study analytic thinking was defined as involving objectively determined, well-defined, (and often quantified) premises leading to logical-rational conclusions (e.g. "My college aptitude scores showed this field to be a logical choice"). Intuitive thinking was defined by global feelings and judgments not proceeding from objectively specifiable premises (e.g. "I can identify personally with the people who work in this area"). Emotional involvement and global feelings are thus taken as definitive for this mode of thought.

The analytic-intuitive distinction given above was originally tested using 47 statements developed from inter-

view protocols. Undergraduates (n = 120) then rated each item according to how much it reflected analytic or intuitive thinking on a 1 (highly analytic) to 5 (highly intuitive) scale, with 3 as the uncertain point. Given a brief description of what these terms meant, the students had little difficulty rating most of the statements. Based on the means and standard deviations of these ratings, statements were selected for their consensual validity. That is, only those items with relatively high means and low standard deviations (at either the analytic or intuitive extreme) were chosen. Items for which response variance did not extend into the intuitive range of the scale were selected as analytical; and items for which response variance did not extend into the analytic range were selected as intuitive. This selection criterion insured that the majority of ratings of selected items were on one or the other side of the uncertain category.

The selection procedure yielded 16 analytic and 11 intuitive statements. Social desirability ratings by an independent sample of 30 students revealed no significant differences in the apparent desirability of intuitive and analytic statements. On a 1 (highly socially desirable) to 5 (highly undesirable) scale the mean for intuitive items was 2.2 and the mean for analytic items was 2.5 ($t = 1.11$, $df = 28$, $p < .15$).

Measures and Analysis

The final 27-item questionnaire was administered to approximately 500 Kansas State University undergraduates representing all educational levels and various major areas of study. Students indicated the degree to which each item was characteristic of their thinking toward choice of majors on a 1 (very important) to 5 (very unimportant) scale, with 3 representing the neutral point. An index score was then computed for each subject which reflected the relative importance of intuitive and analytic statements. The 1 to 5 scale was changed to a -2 to +2 scale for analytic items, and a +2 to -2 scale for intuitive statements. Responses to each item type were then added together producing a single index score for each subject. Using this scoring procedure the higher the index score (i.e. the more intuitive items are endorsed and/or analytic items are not endorsed) the more intuitive thinking is indicated. The smaller the score the more analytic thinking is shown. Index scores could potentially range from -54 to +54. The majority of actual scores ranged from -16 to +28 (see Figure 1).

The subject sample was broken down according to sex, area of study and 4 classes (i.e. freshman, sophomore, etc.,). Students were classified into 3 areas of study: soft

(humanities, social sciences, etc.), hard (natural sciences, engineering, etc.) and business-professional (business, accounting, pre-law, etc.). This sample stratification produced a 2 x 3 x 4 factorial design with approximately 20 subjects per cell, representing 189 freshmen, 116 sophomores, 73 juniors and 65 seniors.

Results and Discussion

Differences in index scores associated with students' sex, area of study and level of education were assessed by a 2 x 3 x 4 harmonic mean analysis of variance (see Table 1). This analysis showed significant main effects for year in school and area of study. There was no significant main effect for sex, although sex yielded significant interactions with major area and year in school. These results are discussed in terms of developmental trends and specific individual differences.

Developmental Changes

Shifts in the relative importance of analytic and intuitive thinking across years in school are presented in Figure 2. Higher index scores indicate greater endorsement of intuitive items and lower scores more agreement with analytic items. In line with predictions from past research, personalized goals and feelings become more integrated in student thinking as they progress through

Figure 1

Distribution of Index Scores in Sample of 443 Students

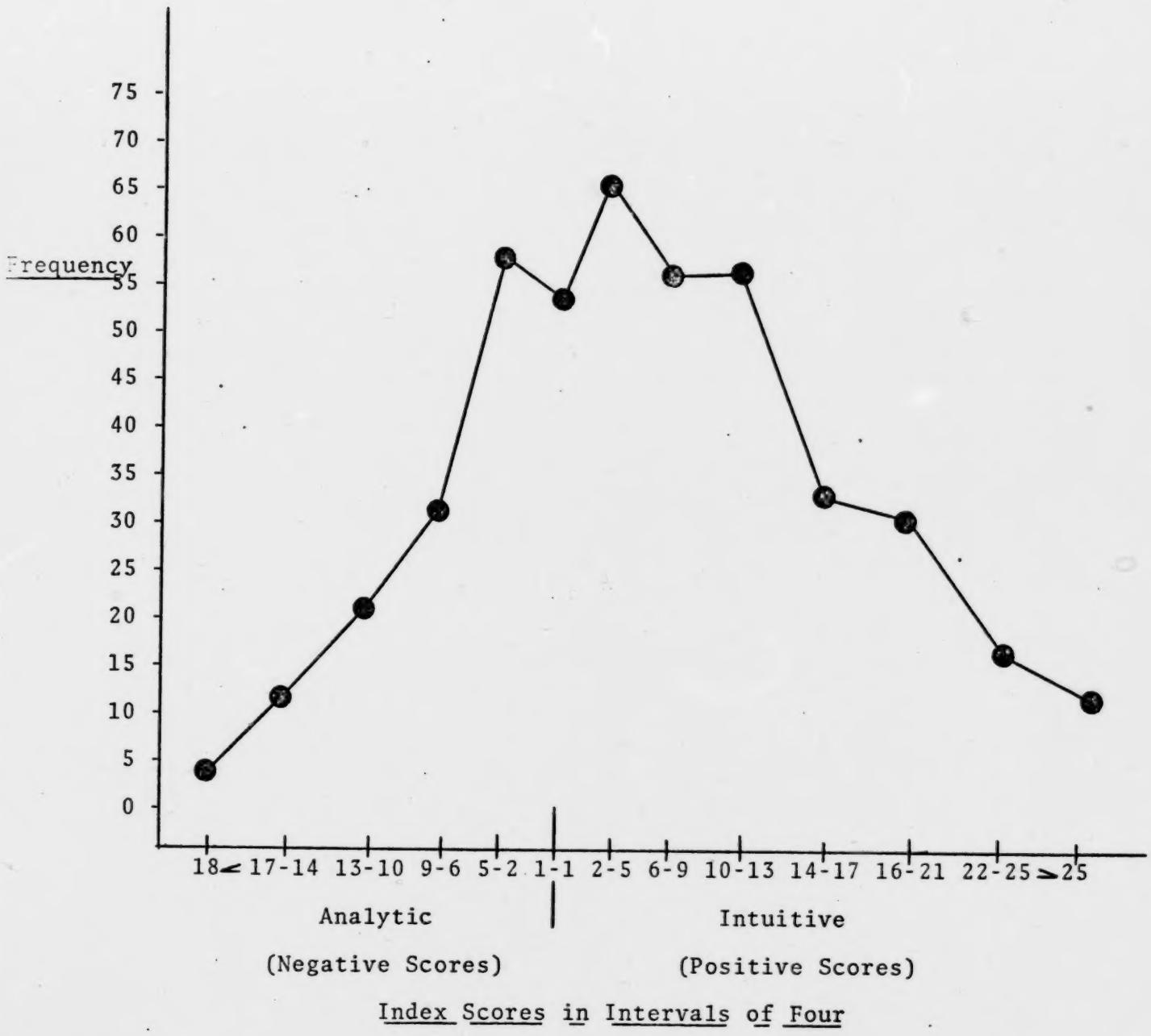


Table 1

Comparisons of Index Scores in 2X3X4 Analysis of Variance Representing Students' Sex, Area of Study and Year in School

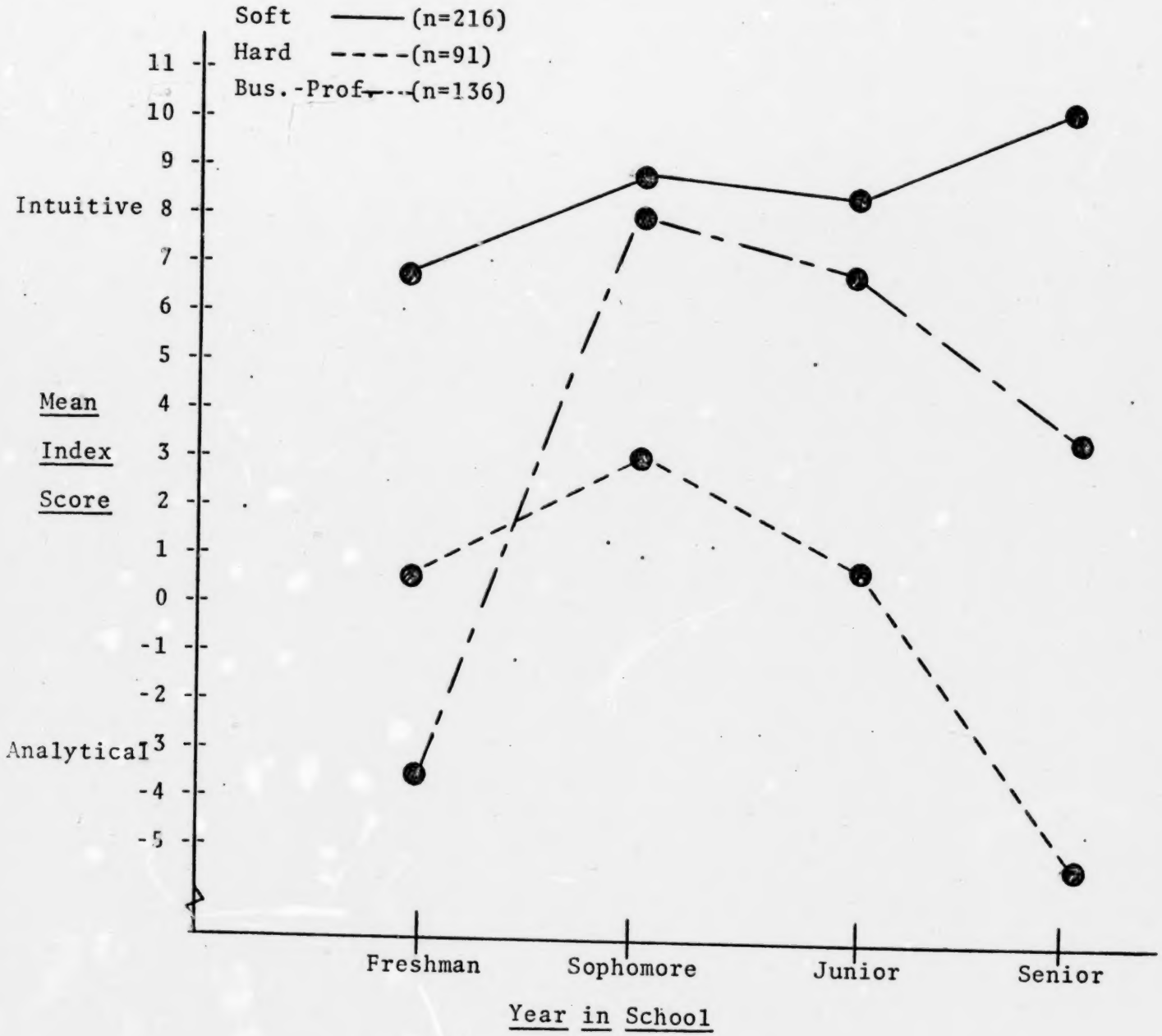
Source	SS	df	MS	F
Year	796.33	3	265.44	3.42**
Major	2558.9	2	1279.45	16.48**
Sex	46.99	1	46.99	1.0
Maj.X Yr.	1139.6	6	189.93	2.45*
Maj.X Sex	934.44	2	467.22	6.02**
Sex X Yr.	221.02	3	73.67	1.0
Sex X Maj.X Yr.	657.92	6	109.65	1.41
Error	32533.48	419	77.64	-----

p .05

p .01

Figure 2

Index Scores of Students in Soft, Hard and Business-Professional Curriculum at Each Education Level



school. However, the decrease in importance of external factors (e.g. test scores, expert opinion) characteristic of analytic thinking, occurs exclusively between the freshman and sophomore year; reflecting perhaps the working out of "sophomore slump". Furthermore, the trend across years is markedly different for students in the 3 fields of study. All students show more intuitive scores in the sophomore year, however students in soft majors generally continue this trend, while students in hard and business-professional fields show a shift back to a more analytic thinking in the junior and senior years. This latter finding may reflect the pragmatic pressures of graduation and obtaining a job, in which more analytic assessment of future prospects become important for hard and business-professional majors. Thus, while all groups shift to more intuitive scores in their choice of majors, only students in soft curriculum maintain this change.

In addition to type of major, the number of changes in major field are also related to developmental shifts in thinking. In a separate analysis, index scores of students who never changed majors as opposed to those who changed at least once were assessed in relation to year in school. Computed by a 2 x 4 harmonic mean analysis of variance, significant differences were found for year in

school, number of majors and the interaction of these two variables[1], as shown in Figure 2, students who had never changed apparently remain more analytical than those who had held two or more majors. While opposite shifts in the junior and senior year are seen for the two groups, students who never changed majors generally maintain a more analytic orientation throughout college. Examination of the type of majors held by these individuals did not reveal them to be characterized by any particular area of study, which might have indicated a "holding power" of particular fields. Given this, these results may suggest that a strong analytic orientation reduces susceptibility to the uncertainties and shifts in career thinking generally encountered among college students.

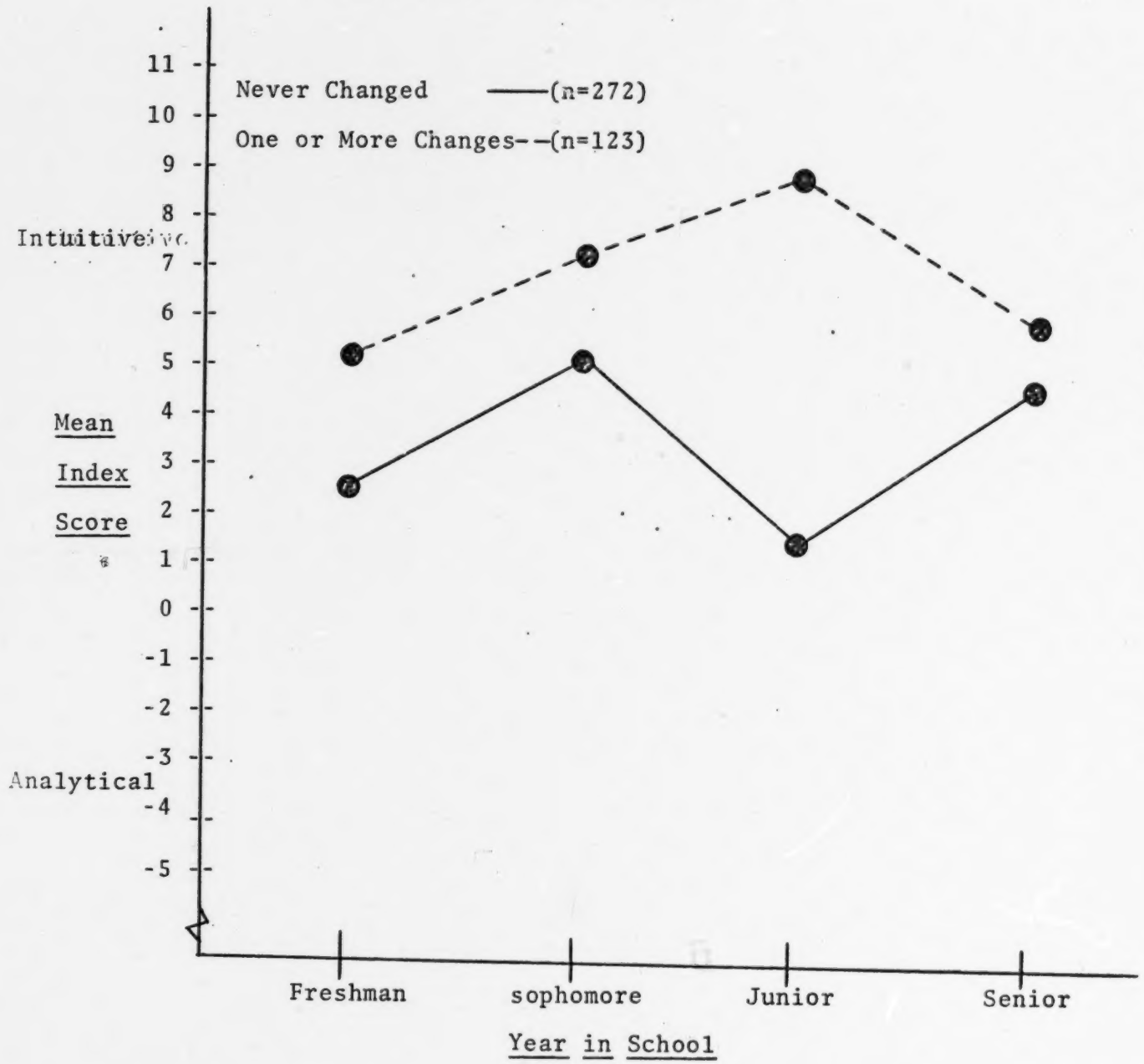
Individual Differences

Area of study and students' sex also reflect the differential importance of the analytic-intuitive dimension (refer to Table 1). Subsequent analyses (t-tests) showed significant differences in index scores among each of the three curiculum groups. Students in soft majors had more intuitive scores than those in business-professional fields, who in turn had more intuitive scores than students in hard areas of study. While students' sex alone made no general difference there was an interaction with area of study.

[1]F-ratios are: year in school, F = 27.09, df = 3/387; number of majors, F = 290.3, df = 1/387; interaction, F = 58.1, df = 3/387.

Figure 3

Index Scores of Students at Each Education Level Who Never Changed Majors Versus Those Having Changed One or More Times



Females in soft and hard majors showed slightly more intuitive scores than males in these fields, but markedly more intuitive scores than males in business-professional majors. Results of t-tests showed only the latter difference to be significant. Generally, students' thinking seems to reflect many of the characteristics of the chosen field of study. Analytically oriented hard majors, for example, may reflect the emphasis on formula-type problem solution based on objectively determined information. In contrast, students in soft majors may reflect more integration of personal feelings and goals with an area of study which is both more ambiguous and open to individual expression.

Integration and Weighting of Analytic-Intuitive Factor Dimensions

To obtain a more precise picture of the various components of the analytic intuitive dimension and their differential representation in student thinking, responses to the questionnaire were factor analyzed (see Table 2). Rotated to a varimax solution, this analysis produced four readily identifiable factors. The different item-types (analytic and intuitive) loaded almost exclusively on independent factors, with only 2 reversals (items 10 & 19). Items with the highest loadings on a factor were taken to represent that factor. In most cases[1] this resulted in selected items having significant loadings on only one factor (p. .005). Appendix A lists the items within each factor.

[1]exceptions are items 7, 12, 16, and 22 in which significant loadings occurred on two factors.

Table 4

Factor Structure and Loadings of 27-Item Questionnaire

Item	Factor I	Factor II	Factor III	Factor IV
1A*	(.803)**	-.026	.015	.060
2I	-.306	(.181)	.036	-.010
3A	.069	-.006	(-.496)	.089
4I	.016	.010	-.004	(.229)
5A	(.666)	.099	-.029	.081
6A	(.316)	.061	-.242	.083
7A	.329	-.109	(-.511)	.210
8I	.111	.136	-.115	(.792)
9A	.089	.088	(-.822)	.107
10A	-.100	-.193	-.123	(.591)
11A	.180	(.261)	-.135	.101
12I	.041	.327	-.139	(.710)
13A	-.110	.014	(-.605)	-.132
14I	.048	(.659)	-.040	.018
15A	.160	.114	(-.811)	.127
16A	.340	.070	(-.633)	.158
17I	.029	(.628)	.086	.132
18A	.155	.166	(-.285)	.163
19I	-.016	.079	(-.419)	-.044
20A	(.175)	-.008	-.029	.030
21I	.044	(.776)	-.092	-.030
22I	.001	(.452)	-.364	.009
23I	.037	(.592)	-.120	.080
24A	(.397)	.061	-.134	.177
25A	(.701)	-.013	-.244	.039
26A	(.774)	.067	-.203	-.123
27I	-.001	(.724)	-.052	.151
Percent of Variances	20.3	9.9	7.6	6.5
Average Loading of Selected Items	.547	.534	.573	.581

*A -- denotes original coding as an analytic item

I -- denotes an intuitive item

**() -- indicates item was taken as representing factor

Each factor was composed of statements highly related in content. Factors I and III were characterized by well defined statistical information, expert opinion and unambiguous subject matter in the first instance (factor I) and aptitude test scores, grades, counselor advice and high school experiences in the second instance (factor III). Factors II and IV were characterized by emotional satisfaction and global feelings in the former and positive feelings and identification towards faculty, in the latter. Factors I and III represent a breakdown of analytic items and Factors II and IV of intuitive items. Thus, the analytic-intuitive dimension is composed of highly consistent, though not completely independent factors.

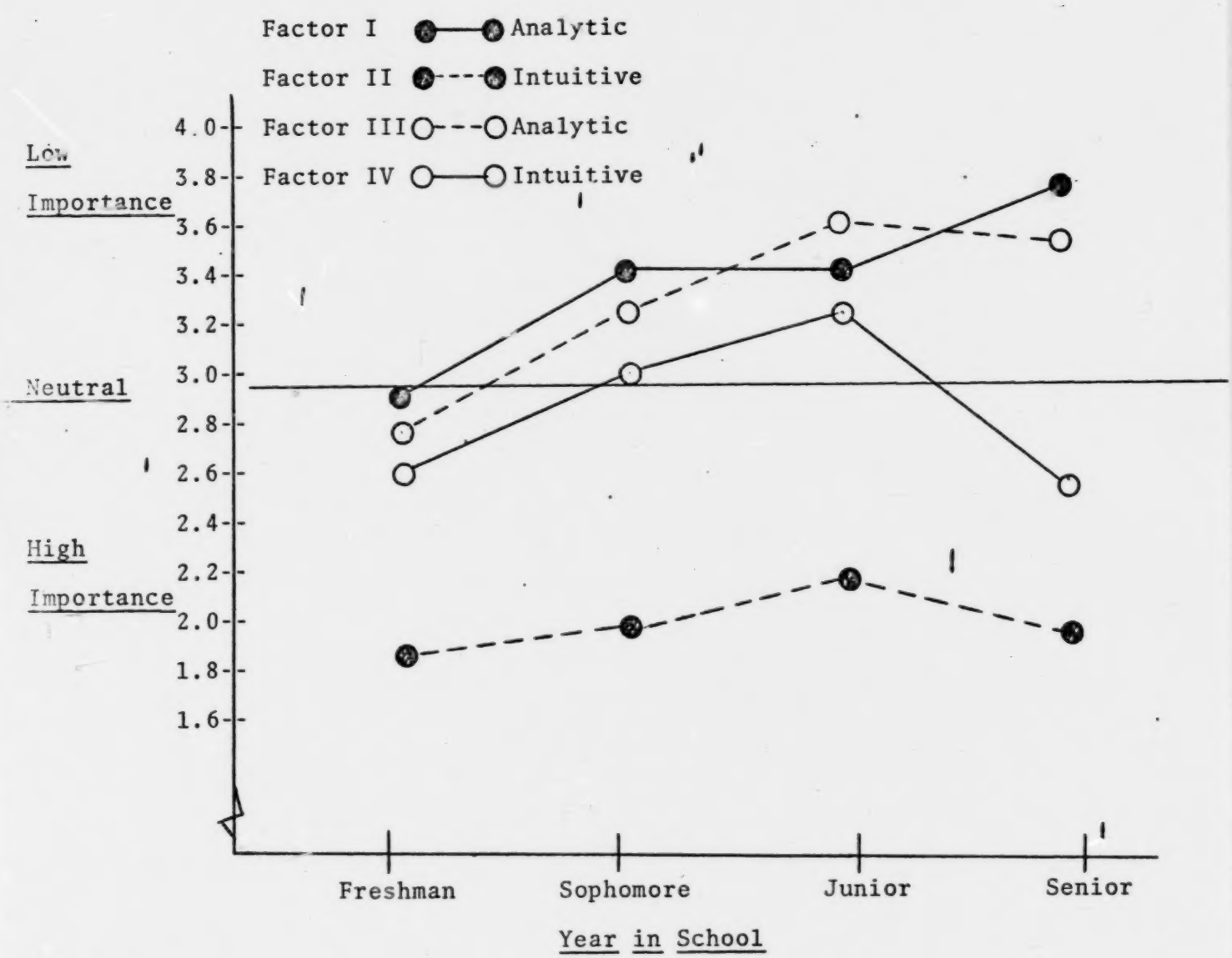
These results suggested that analyses of how the 4 factors are differentially weighted and integrated may specify the different thinking orientations in more detail. As an initial probe in this direction, the average rated importance of items within each of the 4 factors was computed. That is, each student was given a score on each factor which indicated its' importance in his thinking toward choice of majors. The independent contribution of each factor to the previous results could then be examined. Conclusions based on this analysis should be regarded as only tentative, for at least two reasons.

First, detailed specification of the integration and weighting of information should be investigated at the individual level to obtain a clear picture of variations in cognitive organization. The present work involves group data which is only suggestive of individual functioning. Second, the lack of complete independence of the 4 factors may tend to obscure conclusions when they are treated as independent. Recognizing these limitations, an example of this analysis will be given which suggests how previous conclusions may be specified in more detail.

Figure 4 presents the average rated importance of each factor for soft majors across year in school. Recall that previous results showed these students to exhibit general increases in intuitive thinking from freshman to senior years. In relation to the 4 factors this shift in thinking reflects the decrease in importance of Factors I and III. The logical-rational thinking emphasized in these two factors becomes relatively unimportant. Thus, the integration of Factors II and IV (intuitive factors) with Factor II being weighted most heavily, seems to represent the thinking of seniors. As might be expected, students in hard and business-professional fields show quite different configurations of the 4 factors. The main import of these findings is that shifts in thinking appear due to variations in the weighting and putting together of analytic and in-

Figure 4

Mean Rated Importance of Items Within Each Factor for Soft Majors at Each Education Level



tuitive factors. Thus, the possibility of specifying thinking processes precisely at the individual level, in terms of differential weighting and integration, is strongly suggested by these results.

In sum, the implications of the present work are two-fold. First, as suggested by previous research, student career decisions can be fruitfully conceptualized as reflecting different modes of thinking assessed by the differential weighting and integration of analytic and intuitive factors. Not only do students reveal variations in cognitive mode according to sex, area of study and number of majors, but shifts in thinking appear mediated by generalized college experiences, as reflected in changes across education levels. As an extension of prior laboratory studies involving highly limited tasks, the present work suggests the fruitfulness of research investigating naturalistic decision processes within a multi-dimensional thinking framework.

The present study also implies that students' career choices are not necessarily reflected in maximally rational processes. Many students show little concern for objectively determined information and logical-rational decisions. As Blackburn (1971) suggest, heavy emphasis on analytic thinking may be a source of alientation for more intuitively oriented students. Thus, vocational and guidance counselors may be

of greater benefit by recognizing the diversity of approaches represented in student thinking, rather than encouraging one of several alternative modes. Heavy reliance on aptitude and vocational tests in high school for example, may ill-prepare freshman for the uncertainties and confusions faced in college.

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Appendix A

Questionnaire Items Arranged by Factors

Items Representing Factor I

I chose my present major because:

1) it seems like the best way to gain the financial success I want.

5) according to statistical surveys and opinions of professionals this area will become very important in the future.

6) in this area the difference between correct and incorrect work is always clear.

20) in this area there is nothing ambiguous about the material.

24) in my present major I deal with problems which have correct and verifiable solutions.

25) it will enable me to work in a large organization providing maximum security and fringe benefits.

26) statistical analysis and projections of the job market show that this is a rational way of preparing for a good job.

Items Representing Factor II

2) in the long run it is best to follow your gut-feelings no matter what other people say.

11) it deals with ideas and abstractions which require mental discipline and careful logical thought.

14) it is emotionally satisfying to me now.

17) work in this area is always dynamic and changing.

21) it will prepare me for work from which I can gain great emotional satisfaction.

22) it will allow me to fulfill an ambition I have had since I was a young child.

23) at a gut-level this is the area I think I should be in.

27) my personal feelings and experiences are relevant to the subject matter.

Items Representing Factor III

3) I did well in this particular subject in high school.

7) a college counselor showed me that this field was a logical choice.

9) my high school vocational aptitude test scores showed this field to be a logical choice.

13) of my high school experiences with the complexities and ingenious methods and theories in this area.

15) my college vocational aptitude scores showed this field to be a logical choice.

16) a high school counselor showed that this field was a logical choice.

18) of my college experiences with the complexities and ingenious methods and theories in this area.

19) a warm feeling of personal admiration for a high school teacher led to my interest in this field.

Items Representing Factor IV

4) a warm feeling of personal admiration for a college instructor led to my interest in this field.

8) the faculty and students you meet in this area are my kind of people.

10) the course requirements in this field allow great flexibility and freedom of choice.

12) I can identify personally with the people who work in this area.